

CHECKLIST

CHEMTECH

MARCH 1992

What makes Yoshio invent

- ☐ 136 Japanese companies develop new products in less time and at lower cost than their western counterparts. Why? **The Economist** reviews a McKinsey study.

Sense and nonsense about beer

- ☐ 138 From ancient Sumeria to modern day brewing, **Maytag** teaches about beer making.

The pull and push on chemistry

- ☐ 144 Chemistry's advances in the next 20 years will be "pulled" by societal concerns and "pushed" by scientific curiosity. Here **Whitesides** views the "push." (In the January issue he prognosticated about the "pull.")

Stories from the front

- ☐ 154 Sometimes a consultant's advice is worth . . . well, let **Copulsky** tell you some "war" stories.

Help wanted

- ☐ 160 The ACS offers many employment services. **Wheeland** describes them.

Preparing problem solvers

- ☐ 162 The Doctor of Chemistry curriculum emphasizes practical problem solving. **Melton** discusses the program and its grads.

Puzzling chemistry

- ☐ 168 Some intriguing problems about runners, candles, rubber bands, and zeolites are formulated by **Tolman** and **Jackson**.

From coal to acetic anhydride

- ☐ 172 What it takes to achieve successful commercial innovation in the commodity chemical business is reported by **Agreda, Pond, and Zoeller**.

State-of-the-art GC/MS

- ☐ 182 Advances in instrumentation combined with powerful computers revolutionized analytical chemistry. **McLafferty** and **Michnowicz** describe an exciting development.

129 The Industrial Chymist

- ☐ in which **Luberoff** looks into the future.

131 The new Editor

- ☐ in which **Durniak** introduces **Gelbein**, who introduces the future.

132 Write On

- ☐ in which the media are brought to task again on their lack of balanced reporting.

133 Heart Cut

- ☐ in which we call your attention to solid H_2O_2 , a new zeolite, improved photovoltaics, detecting breast tumors, and . . .

135 View from the Top

- ☐ in which **Van Mynen** describes how to avoid another Bhopal.

142 The Best of CHEMTECH

- ☐ in which our Board wrestles with selecting the most important paper of 1991.

IBC The Last Word

- ☐ in which **Newman** offers insight into economic reporting.

Volume 22, No. 3, pages 129-192 ISSN 0009-2703
CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer: ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTECH

The Innovator's Magazine MARCH 1992



Page 172

CHECKLIST

CHEMTECH

APRIL 1992

Principles of holistic (1) medicine applied to infrastructure maintenance: A test case

When the bridge caught fire

Finding out

The renegade strategy

Nuclear waste: Can we contain it?

In search of a safe mineral fiber

A novel biochemical sensor

When oil spills emulsify

Higher solids epoxy coatings

Specialty chemicals from synthesis gas

200 Those roads, bridges, and tunnels that we take for granted finally have their champion. **Catapano** sensitizes us.

202 Will Japanese perseverance help Bridgestone turn ailing Firestone around? **The Economist** wonders.

205 Need information on job safety and health? **Wiseman** tells you how to get it.

208 Success means individuals taking risks and creating new value for the customer. **Peters** tells us to hire and protect the "renegades."

214 Safe disposal means absolute containment for 300 to 500 years. **King, Ikeda,** and **Shoesmith** use corrosion as the basis for designing storage vessels.

220 Driven by the need to find an alternative to asbestos, **Griffith** invented sodium calcium polyphosphate fibers.

227 Rapid analysis of biochemical systems is still a wide-open field. **Brennan** and **Krull** have a novel approach.

236 "Chocolate mousse" water-in-oil emulsions complicate spill cleanup. **Bobra, Fingas,** and **Tennyson** explain why they form.

242 The response to an environmental challenge is reviewed by **Massingill** and **Waters**.

248 Produce amino acids from olefins, CO/H₂, and amides. **Lin** and **Knifton** have explored the reactions for a wide range of specialty chemicals.

193 **Innovator's Notebook**
☐ in which **Gelbein** reflects on how to sell R&D projects to management.

194 **Write On**
☐ in which respondents focus on U.S. chemistry education, recycling, and hazardous waste reduction.

194 **P.S.**
☐ in which the discussion of "irrationality" and public awareness is continued, and the World Fuel Cell Council is described.

195 **View from the Top**
☐ in which **MacQuitty** tells us about the upside-down world of accounting practices and tax laws that discourage R&D investment.

196 **Heart Cut**
☐ in which our contributing editors uncover a variety of new reactions and catalysts.

IBC **The Last Word**
☐ in which **Steiger** uncovers an unusual patent.

Volume 22, No. 4, pages 193-256 ISSN 0009-2703 CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

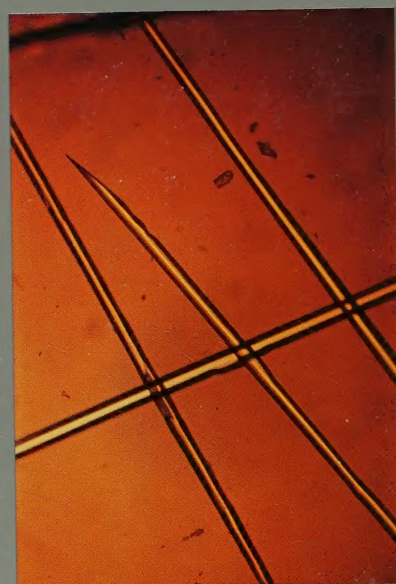
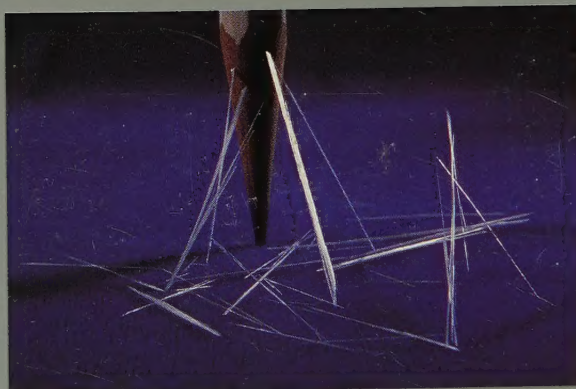
Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTECH

The Innovator's Magazine APRIL 1992



CHECKLIST

CHEMTECH

MAY 1992

- | | | |
|---|--------------------------|--|
| Teaching with computers | 264 | How should we use these ubiquitous machines in schools? Read what the Flanks suggest. |
| | ☐ | |
| Getting started | 267 | Age is not what determines whether the Younger Chemists Committee can help you. Let Orlando explain. |
| | ☐ | |
| Patents: Keeping what's yours | 274 | These are valuable assets. Heines discusses the strategic issues that should be considered if you're confronted with infringement. |
| | ☐ | |
| Creativity and invention are just the start | 280 | Hammer describes his very successful career as an innovator at Du Pont. |
| | ☐ | |
| Amine-based systems for carboxylic acid recovery | 285 | Cost-effective recovery of carboxylic acids from dilute aqueous streams is difficult. King describes a chemical-enhanced extraction. |
| | ☐ | |
| Simplify your analysis of complex systems | 292 | Reduce the number of components to a manageable level by lumping. Krambeck does it for the mixtures encountered in petroleum refining. |
| | ☐ | |
| Structures of supported metal clusters | 300 | Improve your catalysts by understanding the surface chemistry. Gates and Koningsberger use EXAFS as a probe. |
| | ☐ | |
| Recent developments in nonlinear optical materials | 308 | The wondrous things they do with laser beams open up opportunities for a wide range of electro-optical devices. Eaton updates us on the status of the technology. |
| | ☐ | |
-
- | | | | | | |
|--------------------------|---|--------------------------|---|--------------------------|---|
| 257 | Innovator's Notebook | 259 | P.S. | 269 | Guest Editorial |
| ☐ | in which Gelbein listens and reacts to the Great Nobel Debate. | ☐ | in which we update you on solar energy, government service, and more. | ☐ | in which McCullough suggests that controversy on the environment is largely due to differing mindsets. |
| 259 | Write On | 260 | Heart Cut | IBC | The Last Word |
| ☐ | in which taxes on beer are addressed. | ☐ | in which selective oxidation, production of thin films, and CO ₂ lasers are cited. | ☐ | in which Henly divulges the ultimate demo. |
-

Volume 22, No. 5, pages 257-320 ISSN 0009-2703 CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

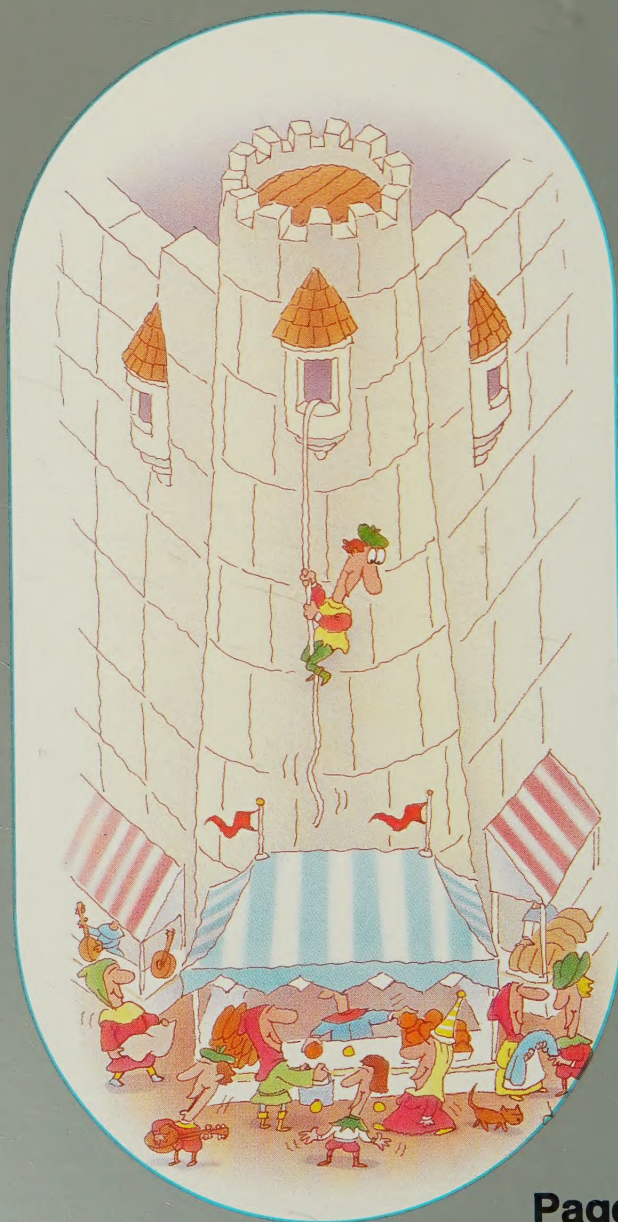
Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTech

the Innovator's Magazine MAY 1992



CHECKLIST

CHEMTECH

JUNE 1992

Everything is the result
of chemistry

- 329 ☐ Of course our readers know this. But **Rayner-Canham** suggests what we should be telling other people.

Use it more than once

- 333 ☐ The recycling process can work if consumers, government, and industry cooperate. **Fleming** gives some examples.

Leather

- 340 ☐ It's 20 steps from the raw skin to the finished product. **Träubel** describes the process and ponders the future of the industry.

Food and biotechnology

- 346 ☐ We don't need new regulations to ensure safety. The framework already exists, says the **IFBC**.

Perfluorochemicals
as a blood substitute

- 354 ☐ These materials can substitute for heme, but biologic compatibility is still a problem, as explained by **Yamanouchi** and **Heldebrant**.

Asymmetric catalysis
by chiral metal complexes

- 360 ☐ Control the steric course of many hydrogenations with high selectivity. A catalyst, BINAP-Ru, does this, as detailed by **Noyori**.

Electrorheological fluids

- 368 ☐ There are fluids that become viscous or even solid in an electric field. **Block** describes the phenomenon and its application to a variety of mechanical devices.

Near-infrared spectroscopy

- 374 ☐ **Ciurczack** uses this new-old technique to analyze food, paper, polymers, and more.

- 321 ☐ **Innovator's Notebook**
in which **Gelbein** differentiates
between tools and toys.

- 322 ☐ **Write On**
in which puzzles and patents
are perused.

On the Cover

Blue—ruthenium
Red—phosphorous
Black—carbon
Green—reacting site

- 323 ☐ **Heart Cut**
in which our contributing
editors highlight membranes,
boron derivatives, and new
fullerenes.

- 327 ☐ **View from the Top**
in which **Adams-Ender**
suggests a pro-active program
that values your employees'
cultural differences.

- 336 ☐ **Well Said!**
in which **Corbett** tackles the
problem of gender-neutral
writing and provides some
guidance.

- 353 ☐ **Guest Editorial**
In which **Evans** discusses the
importance of computer-aided
process design.

- IBC ☐ **The Last Word**
in which **Hoffman** describes
the real menace.

Volume 22, No. 6, pages 321–384 ISSN 0009-2703
CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer:—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

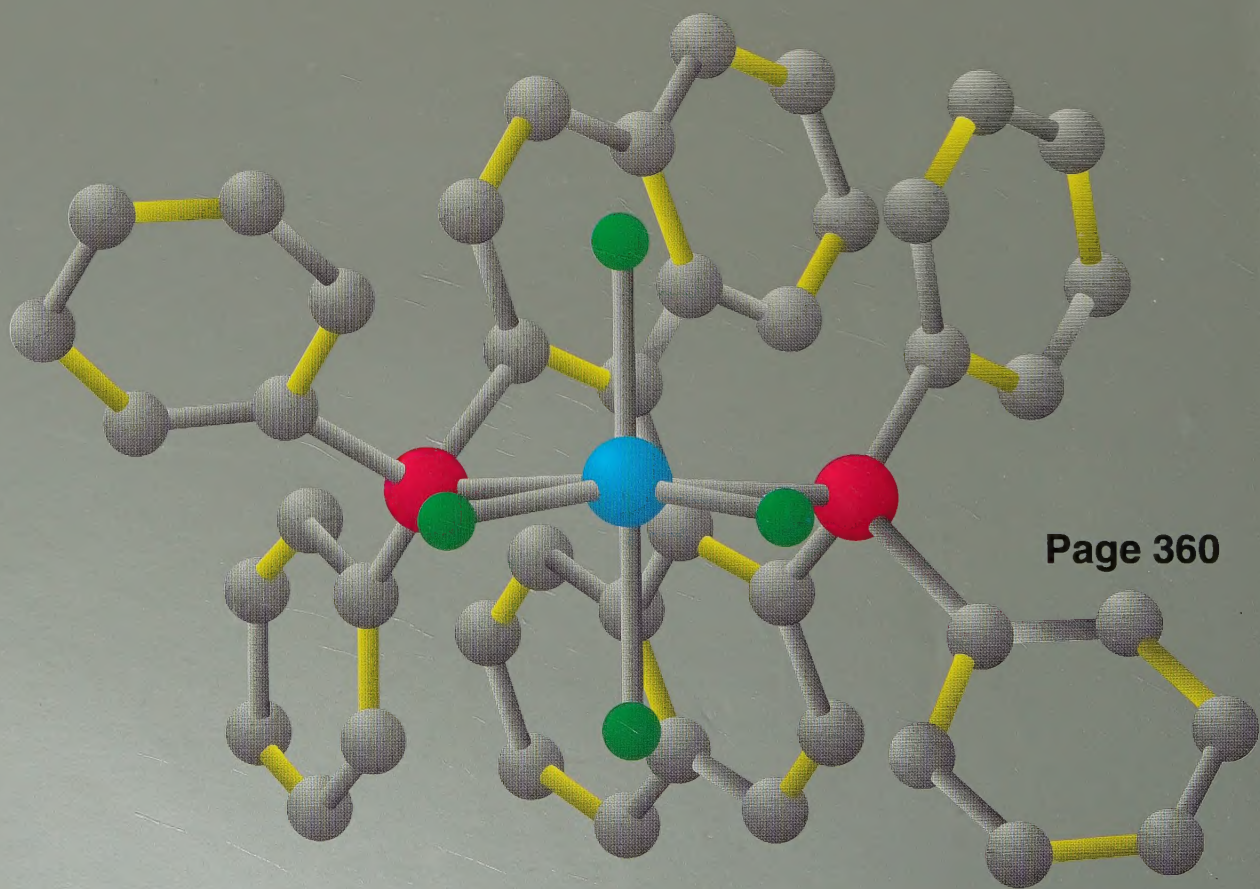
Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTECH

The Innovator's Magazine JUNE 1992



Page 360

CHECKLIST

CHEMTECH

JULY 1992

- | | | |
|---|--------------------------|--|
| The Champion | 393 | A picture-book look at how to steer a project through the innovation process. Davis is the guide. |
| | ☐ | |
| Are you prepared? | 396 | To respond to crisis situations you must have a plan in place. Patterson gives some good advice. |
| | ☐ | |
| The chemistry turn-on | 399 | Make chemistry relevant from the start and increase the talent pool for industry. We should begin with organic, according to Scouten . |
| | ☐ | |
| Innovation on a global scale | 402 | Technology is changing to better meet human needs. The NEC Corporation's global approach is described by Uenohara . |
| | ☐ | |
| Alternative fuels for cars:
Are they cleaner than gasoline? | 406 | Maybe yes and maybe no, says Gushee . This first part of a two-part series defines the problem. |
| | ☐ | |
| Amino acid racemization:
A tool for fossil dating | 412 | Take advantage of the fact that the amino acids in living biological systems are the L isomer and measure the D/L ratio of the fossil. Meyer reviews the technology and gives examples. |
| | ☐ | |
| Secrets of photographic
development revealed! | 418 | The steps of the process are outstanding examples of basic chemical principles. Sahyun gives us a coherent picture of the mechanism. |
| | ☐ | |
| Electrophoresis-enhanced
extractive separation | 425 | Increase the efficiency of protein separations in two-phase aqueous systems as described by Clark . |
| | ☐ | |
| Make polymers from biomass | 430 | New surfactant and biodegradable plastic products are obtained by grafting olefinic monomers onto lignin and wood, Meister reports. |
| | ☐ | |
| Development of continuous falling film
SO₃ sulfonation technology | 436 | It started some 40 years ago and is the preferred method today. Knaggs was in at the beginning and tells the story. |
| | ☐ | |
-
- | | | | | | |
|--------------------------|--|--------------------------|--|--------------------------|--|
| 385 | Innovator's Notebook | 390 | Guest Editorial | OBC | The Last Word |
| ☐ | in which Gelbein challenges science education. | ☐ | in which Atkins tells us the important things to teach future scientists and technologists. | ☐ | in which Schwartz pays homage to the power of the Slinky. |
| 386 | Heart Cut | | | | |
| ☐ | in which our editors cite a new use for permanganate, phase transfer catalysis, tires, and . . . | | | | |

Volume 22, No. 7, pages 385-448 ISSN 0009-2703
CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.
Copyright © 1992 by the American Chemical Society

CHEMTech

The Innovator's Magazine JULY 1992



CHECKLIST

CHEMTECH

AUGUST 1992

Product stewardship: An investment in the future

- 455 Responsibility does not stop at the plant gate, says **Rausch**.
☐

Fragrance chemistry

- 458 **Herman** tells us about its art, science, and history.
☐

Advertising to the chemical industry

- 464 To increase sales and profit, get the message to the right people through space advertising, says **Schmit**.
☐

Alternative fuels for cars: Are they cleaner than gasoline?

- 470 In the second part of the series, **Gushee** elaborates on this question. It doesn't have a simple answer.
☐

Money = $k(\text{people})^4$

- 477 **Garnett** analyzes historical economic data and suggests several simple relationships that can help you make your business decisions.
☐

New technology and the environment

- 482 Primary pollution prevention via catalytic process technology is the strategy described by **Cusumano**.
☐

Managing risk

- 490 The chemical industry uses a new approach, described by **Arendt**, to analyze the risk of its operations.
☐

Supported aqueous-phase catalysis

- 498 This new immobilization method described by **Davis** is useful in hydroformylation, olefin oxidation, and various asymmetric syntheses.
☐

A novel toxic gas microsensor

- 504 The full name is a mouthful, but don't be put off. **Kolesar** describes an ingenious integrated circuit device that measures ppb of toxic gases.
☐

449 Innovator's Notebook

- ☐ in which **Gelbein** test-drives an electric car.

451 Heart Cut

- ☐ in which our editors cite technology for salicylaldehyde, isocyanates, butanediol, and . . .

IBC The Last Word

- ☐ in which **Bruns** tests your knowledge of analytical techniques.

463 Guest Editorial

- ☐ in which **Ciparick** is concerned about introductory science education.

Volume 22, No. 8, pages 449-512 ISSN 0009-2703
CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer:—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTECH

The Innovator's Magazine **AUGUST 1992**



CHECKLIST

CHEMTECH

SEPTEMBER 1992

- | | | |
|--|------------|--|
| Creative world trade | 520 | Use an exchange of goods and services as part of your international marketing strategy. West describes how to do it. |
| The other side of drug testing | 523 | Testing for drug use is not a perfect science. Holstein says you can minimize the risk of becoming a victim of a false-positive test. |
| Be cited or perish | 534 | Want to know if a scientist's work merits your attention? One way is to analyze the citation frequency of a researcher's papers, advises Edwards . |
| How to position your new polymer in the marketplace | 542 | Start with a value perception analysis to determine the interactions between price, properties, and customer service, says Jacobson . |
| Polymers and the automotive industry | 546 | The marketplace described by Claar is highly competitive, technically demanding, and many-faceted. |
| A waste minimization program that paid off | 550 | Some simple changes can lead to real dividends, say Kerns and Brennan , based on their experiences at Westinghouse. |
| Letting light in; keeping heat out | 552 | Coat glass with a thin film of an appropriate semiconductor and greatly increase its insulating value. The technology is described by Gitlitz , Dirkx , and Russo . |
| Challenges in membrane catalysis | 557 | This approach to simultaneous reaction and separation in the vapor phase is an active area of research. Armor discusses recent developments in the field. |
| Anti-HIV therapy: A lesson in drug design | 564 | The enemy is complex and formidable, and is being attacked on many fronts in this review by Mansuri and Hitchcock . |
-
- | | | | | | |
|--------------------------|--|--------------------------|---|--------------------------|---|
| 513 | Innovator's Notebook | 515 | P. S. | 540 | Distillations |
| ☐ | in which Gelbein dreams of converting coal to energy and food with the help of a little sunlight. | ☐ | in which we give updates on near-IR, shortage of scientists . . . | ☐ | in which our editors examine cleanup costs and technology policy. |
| 515 | Write On | 516 | Heart Cut | IBC | The Last Word |
| ☐ | in which we're informed on human potential and potential problems. | ☐ | in which our editors describe epoxidation, micromotors, microbial oxidation . . . | ☐ | in which Baker says . . . no, states . . . no, proclaims . . . well, see for yourself. |
| | | 529 | Opinion | | |
| | | ☐ | in which McGee wonders where all that federal research money is going. | | |

Volume 22, No. 9, pages 513-576 ISSN 0009-2703 CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.
Copyright © 1992 by the American Chemical Society

CHEMTECH

The Innovator's Magazine SEPTEMBER 1992



Page 552

CHECKLIST

CHEMTECH

OCTOBER 1992

Mapping invention and design

- ☐ **584** Here's a way to understand technological creativity. **Gorman** and **Carlson** show how, using the invention of the telephone as an example.

Carbon-11

- ☐ **592** Incorporate this versatile isotope into tracer molecules. Use them for C₁ and medicinal chemistry studies, says **Jewett**.

Tailoring carbon fibers for adsorbing volatiles

- ☐ **597** The goal of **Economy, Foster, Andreopoulos,** and **Jung** is new adsorbents for environmental contaminants.

Quality by design

- ☐ **604** **Deming** tells us how to set up to screen for important parameters in an experimental design.

How to recover recombinant protein products

- ☐ **608** Scale up the chromatography processes you used in the lab with the guidance offered by **Prouty**.

A continuing success: The UNIPOL process

- ☐ **616** Technical advances have expanded the versatility of this olefin polymerization process, **Burdett** tells us.

Use photochemistry to modify membranes

- ☐ **624** Use this method developed by **Swanson, Dunkirk, Pietig,** and **Guire** to produce hydrophilic surfaces.

Starch/polyolefin blends as environmentally degradable plastics

- ☐ **627** We can make them, but the jury is still out as to consumer acceptance, says **Pettijohn**.

From ancient Egypt to ancient Washington

- ☐ **630** Food safety evaluation concerns have not changed, but the tools to deal with them have. Will we use them? **Miller** wonders.

577 Innovator's Notebook

- ☐ in which **Gelbein** looks for a change in attitude.

578 Write On

- ☐ in which bovines are controversial and . . .

578 P.S.

- ☐ in which we cite ACS's Project SEED, more on electric vehicles, and . . .

580 Heart Cut

- ☐ in which we describe a new NO_x sensor, polishing diamond films, stereospecific ring opening, and . . .

640 The Last Word

- ☐ in which **Harmon** wonders about ultimate questions.

Cover photo: UNIPOL polypropylene unit at Union Carbide's Sadrift plant. Courtesy Ian Burdett

Volume 22, No. 10, pages 577-640 ISSN 0009-2703 CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83. Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer:—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTech

The Innovator's Magazine OCTOBER 1992



- | | | |
|--|--------------------------|--|
| The compleat sales rep | 646 | Empower your sales force and let them do creative selling, says Mayer . |
| | ☐ | |
| Sampling in the air | 648 | Up, up, and away is how Lund and Starkey think it should be done. |
| | ☐ | |
| Designing new sensors with old chemistry | 658 | The trick, according to Walt , is to use irreversible reactions with continuous reagent delivery systems. |
| | ☐ | |
| Quality by design | 666 | Have many variables to worry about? Deming shows how to screen for the important ones. |
| | ☐ | |
| Create drugs, not waste | 674 | Examples of what has been achieved in one pharmaceutical company are described by Venkataramani, Vaidya, Olsen, and Wittmer . |
| | ☐ | |
| Photocatalysis: Decontamination with sunlight | 680 | Why certain metal oxides are active catalysts in aqueous systems is explained by Fox . |
| | ☐ | |
| Fractal concepts in chemistry | 687 | Leave Euclid behind if you want to find out about the real world, says Sahimi . |
| | ☐ | |
| Bioprocess flowsheets made easy | 694 | Optimize your design with help from a knowledge-based system developed by Yang, Gandikota, Davis, and Marchio . |
| | ☐ | |

- | | | |
|--|---|---|
| 641 Innovator's Notebook | 655 Opinion | 686 Distillations |
| ☐ in which Gelbein considers "green" messages and messengers. | ☐ in which Sawhill shows that "green pays." | ☐ in which we talk about approving gene-therapy trials and about sweeteners. |
| 642 Heart Cut | 664 The Industrial Chymist | IBC The Last Word |
| ☐ in which we cite new materials for automobile components, encapsulating microorganisms, an artificial pancreas, and more. | ☐ in which Luberoff claims that the entropy of solvation can be your salvation. | ☐ in which Dresner builds a theory. |

Volume 22, No. 11, pages 641-704 ISSN 0009-2703 CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347
Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer:—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTECH

The Innovator's Magazine NOVEMBER 1992



On the fast track	711	Do your planning but make decisions quickly and decisively, cautions Peters .
	☐	
Superconducting oxide-on-metal ribbons	713	Overcome one of the major problems to practical high-temperature superconductors with these composites described by Wu, Wang, and Lin .
	☐	
Reactions in supercritical fluids	719	The unique properties of these materials provide handles for speeding up and increasing conversions of reactions and thermodynamics in this study by Boock, Wu, LaMarca, Klein, and Paspek .
	☐	
Using positrons for structure analysis	724	When these positive "electrons" hit matter, they produce a gamma-ray fingerprint. Granata, Moussavi-Madani, and MacQueen use the technique to measure void volume in polymers and barrier properties of coatings.
	☐	
Doing immunoassays in the field	732	Speed up hazardous waste site remediation by using the portable enzyme-linked immunosorbent assay (ELISA) system described by Friedman .
	☐	
Detect virus activity with a biofilm sensor	738	Combine an oxygen sensor with a film of the cell sample in this novel application studied by Holodnick, Goldblum, Maassab, and Mancy .
	☐	
Polymers today and tomorrow	742	In this overview of the European marketplace, Uerdingen reports on the accomplishments and future challenges.
	☐	
Strategy of research	751	How to get around Murphy's Law in your development programs is Minor's message.
	☐	
The Coriolis effect	757	And how to put it to work in mass flow meters is taught by Lippman .
	☐	
705 Innovator's Notebook	749 Distillations	768 Author's Guide
☐ in which Gelbein talks about his travels.	☐ in which we learn about a new twist.	☐ in which we explain how to get published in CHEMTECH.
707 Heart Cut	763 CHEMTECH's 1992 Index	IBC The Last Word
☐ in which we alert you to transgenic crops, a new sweetener, new catalysts . . .	☐ in which we list what, where, and who for 1992.	☐ in which Schwartz worries us about big numbers.

Volume 22, No. 12, pages 705-768 ISSN 0009-2703 CHTEDD

CHEMTECH (ISSN 0009-2703) is published monthly by the American Chemical Society at 1155 16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices.

POSTMASTER: Send address changes to CHEMTECH, Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210.

Canadian GST Reg. No. R127571347

Subscription Rates 1992: 1 year subscriptions—Members \$43; Nonmembers (individual personal use), \$83; Companies, institutions, libraries, \$365; Student members, \$21.50; Mexico and Canada add \$9 for postage. Europe add \$16 for postage, all other countries add \$21. Overseas subscriptions are sent by air freight. Canadian subscriptions are subject to 7% GST. Send order with payment to American Chemical Society, Dept. L-0011,

Columbus, OH 43268-0011. Single copies \$31 (current), \$36 (pre-1992). To order printed, microfiche, and microfilm single or back issues, call 800-333-9511. Nonmember subscribers in Japan, enter subscriptions with Maruzen Co. Ltd., 3-10 Nihon-bashi 2-chome, Chuo-ku, Tokyo 103, Japan; (03) 272-7211.

Editorial Matters: Refer all editorial matters to Abraham P. Gelbein, Editor, CHEMTECH, ACS, 1155 16th St., N.W., Washington, D.C. 20036.

Advertising Sales: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881; (203) 256-8211.

Service: For change of address, send old label with new address to ACS Membership and Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. Allow 6 weeks to effect change. Refer claims for missing issues, information on status of accounts, etc., to this office.

Disclaimer—ACS assumes no responsibility for opinions advanced by contributors to its publications. Editorial views

are those of the author and do not necessarily represent the official position of the Society. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

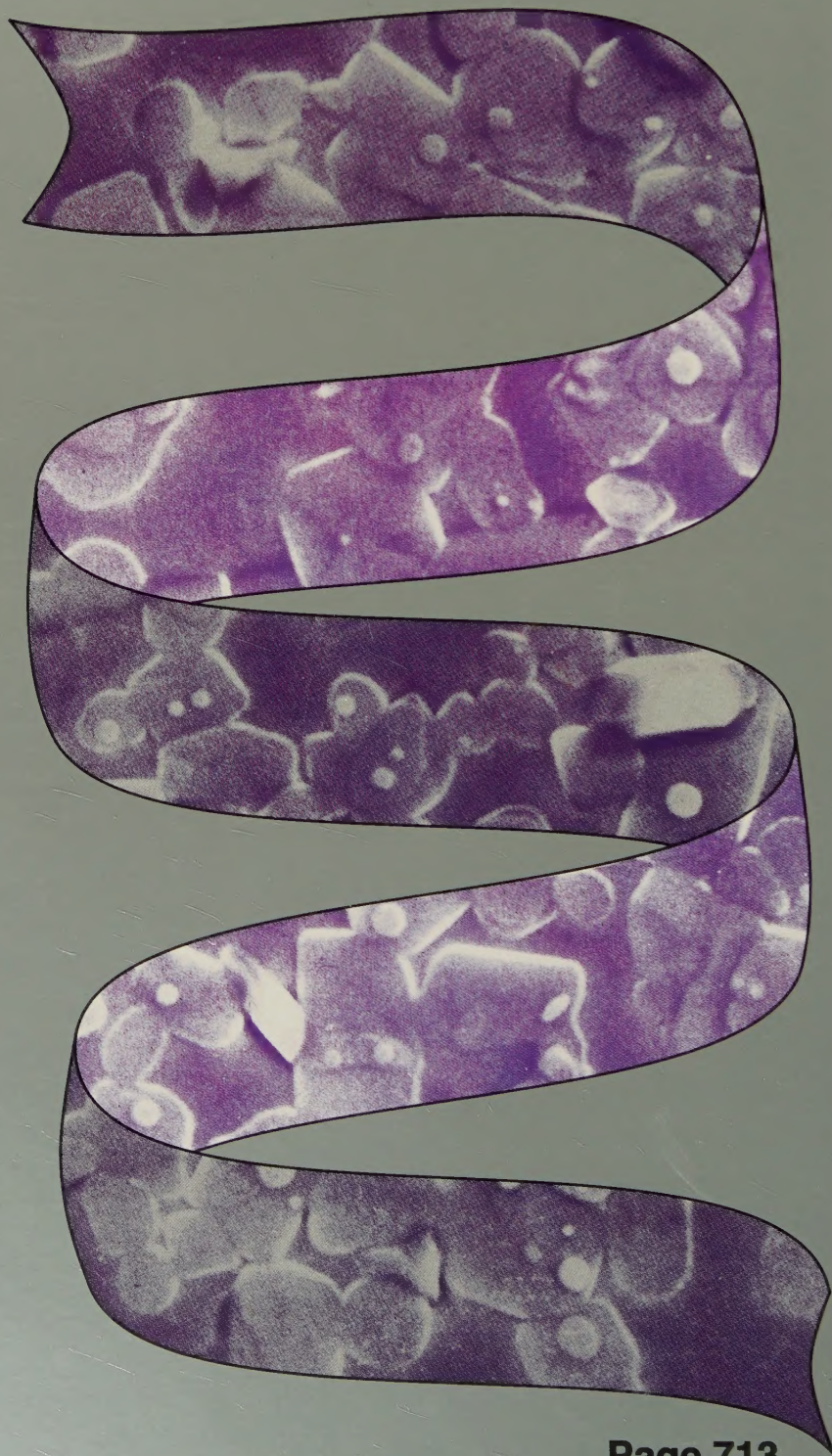
Reproduction: A person may make a single copy of any article with a CCC code for personal use without charge. Copying beyond that is allowed only if a fee of \$3.00/copy is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. A CCC code printed at the bottom of the first page of an article indicates that ACS owns copyright or has permission to collect the copying fee for that article. A record of that code should accompany payment.

Other permissions can be obtained from the ACS Copyright Administrator, 1155 16th Street, N.W., Washington, D.C. 20036, 202-872-4367.

Copyright © 1992 by the American Chemical Society

CHEMTTECH

The Innovator's Magazine DECEMBER 1992



ChemTech

**The following issues
are missing:**

v.22:Jan, Feb (1992)

